

## PACKAGING RELEASE VALVE FOR MICROWAVABLE FOOD ITEMS

### RELATED APPLICATION

This application claims priority of United States Provisional Patent Application Serial No. 60/511,777 filed October 16, 2003, which is  
5 incorporated herein by reference.

### BACKGROUND OF THE INVENTION

#### 1. FIELD OF THE INVENTION

The invention relates to a release valve for use with packaging of food items. More particularly, the invention relates to a release valve that relieves  
10 pressure generated during a heating of the package in an oven.

#### 2. DESCRIPTION OF THE RELATED ART

Food items are commonly stored in packaging allowing the food items to be warmed or cooked in an oven while remaining sealed within the packaging. Typically, the packaging includes a molded plastic container and a  
15 flexible sealing film adhesively secured along a lip of the container. Instructions are usually provided directing the user to puncture holes in the sealing film allowing venting of pressurized gases generated within the packaging during heating in the oven. But, many users ignore such instructions potentially resulting in packaging that ruptures or bursts from the build-up of  
20 excess pressure.

Pressure release valves are known for relieving pressure generated within a package. An example of such a valve is provided in United States Patent 4,444,219, which issued to Hollenstein on April 24, 1984. Hollenstein discloses a release valve that can be incorporated into a wall of a package. The  
25 release valve has a body defining a recess and a diaphragm positioned along a closed end of the recess. The closed end includes a plurality of apertures. The diaphragm is displaceable from the closed end to vent pressures generated in the packaging in the order of 1 to 2 millibar. The valve as disclosed in

Hollenstein, however, does not contemplate the use of the valve in a heated environment.

Accordingly, it remains desirable to provide a release valve for use with packaging that maintains a sealed environment within the packaging during storage and vents pressurized gases during heating.

### SUMMARY OF THE INVENTION

According to one aspect of the invention, a valve assembly is provided for venting pressurized gases generated from within an enclosed package during a heating of the package. The valve assembly includes a tubular body, a retaining member and a membrane element. The tubular body has an open end and a closed end. The tubular body defines a recess between the open and closed ends. The closed end has an aperture for venting the pressurized gases therethrough. The retaining member is operative for snap-fit engagement with the tubular body. The retaining member is spaced from the closed end of the tubular body. The membrane element is positioned between the closed end of the tubular body and the retaining member. The membrane element is positioned along the closed end to maintain a substantially sealed environment within the packaging. The membrane element is displaceable from the closed end to allow pressurized gases to pass through the aperture. The membrane element is formed from cast polypropylene so as to not permanently deform during heating of the package.

### BRIEF DESCRIPTION OF THE DRAWINGS

Advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Figure 1 is a top elevational view of a valve body of a release valve assembly according to the invention;

Figure 2 is a side elevational view of the valve body of Figure 1;

Figure 3 is a cross-sectional view of the valve body of Figure 1;

Figure 4 is a top elevational view of a membrane element of the release valve assembly;

5 Figure 5 is a top elevational view of a retaining member of the release valve assembly;

Figure 6 is a side elevational view of the retaining member;

Figure 7 is a top elevational view of the release valve assembly, including the body of Figures 1-3, membrane member of Figure 4, and the retaining member of Figures 5-6;

10 Figure 8 is a cross sectional view of the release valve assembly of Figure 7; and

Figure 9 is a perspective view of a package for food items incorporating the release valve assembly of Figure 7.

#### DETAILED DESCRIPTION OF THE INVENTION

15 The present invention provides a pressure release valve for use with packaging of microwavable food items. When used with packaging for microwavable food items, the release valve opens to relieve pressure generated within the packaging when heated in an oven, such as a microwave, beyond a preselected temperature or pressure range.

20 Referring to Figure 1, the inventive pressure release valve assembly is generally indicated at 10. The release valve 10 includes a tubular body 12 having an open end 14 and a closed end 16. The closed end 16 includes at least one aperture 20 for venting pressurized gas and/or steam, as described in greater detail below. A sector-shaped recess 21 corresponding to the aperture  
25 20 is formed in the closed end 16. The aperture 20 is formed at a bottom surface of the recess 21. Preferably, four petal-shaped apertures 20 are formed in the closed end 16 of the body 12, each being positioned within its own respective recess 21. Most preferably, apertures 20 having a collective area ranging between 12-24 mm<sup>2</sup>. For example, in one particular embodiment each  
30 aperture 20 has an approximate width of 1.8 mm and approximate length of 2.6

mm. The shape and size of the apertures 20 permits the pressure to be rapidly exhausted. The body 12 can have any suitable cross-sectional shape, such as square, oval, octagonal, and triangular. However, as shown in the figures, the body 12 preferably has a circular cross-sectional shape.

5           A flanged portion 22 is defined along the open end 14 of the body 12. The flanged portion 22 is annular and extends radially outwardly from the open end 14. The flanged portion 22 is also concentric with the body 12. The flanged portion 22 includes an inside edge defining a rim 23. The rim 23 has a diameter less than that of the body 12. A recessed portion 24 is defined by the  
10           walls of the body 12 and has a depth defined between the rim 23 of the flanged portion 22 and the closed end 16.

          The release valve assembly 10 also includes a membrane element 30. The membrane element 30 is operative to be received and seated into the recessed portion 24 of the body 12. More specifically, the membrane element  
15           18 seats adjacent the closed end 16 of the body 12.

          The release valve assembly 10 also includes a retaining member 40. The retaining member 40 is operative to be received in the recessed portion 24 of the body 12 in snap-fit engagement with the rim 23 of the flanged portion 22. The retaining member 40 is disc-shaped and has a side having at least one  
20           rib 44 protruding outwardly therefrom. A portion of the membrane 30 is held between the rib 44 and the closed end 16 while the retaining member 40 is engaged with the rim 23. The remainder of the membrane 30 remains deformable and displaceable from the closed end 16 by gases vented through the apertures 20.

25           The retaining member 40 has at least one concave edge 42. The concave edge 42 facilitates removal of the retaining member 40 from the recessed portion 24, by allowing a fingernail or other similarly shaped instrument to pry the concave edge 42 up from and out of the recessed portion 24 of the body 12.

30           Each part of the release valve assembly 10, particularly the membrane element 18, is formed of a cast polypropylene material. The release valve

assembly 10 is used with packaging containing microwavable food items. Below a threshold temperature range of 130-180°C or pressure range of less than 4-7.5 mbars the membrane element 30 remains flat and is seated adjacent the closed end 16 substantially sealing the apertures 20. When the packaging is heated above the threshold temperature range or the pressure exceeds the threshold pressure, the gases deform or displace at least a portion of the membrane element 30 from the closed end 16 allowing gas to vent through the apertures 20. After the pressure within the packaging has equalized with ambient air, the membrane element 30 returns to its start position adjacent the closed end 16 sealing the apertures 20 from further gas exchange.

Referring to Figure 9, the release valve assembly 10 can be incorporated into the packaging 50 for the food items. Typically, the packaging 50 includes a container 51 and a sealing film 52. An aperture 54 is formed in the sealing film 52. The aperture 54 is defined by a continuous inner edge 56. The inner edge 56 corresponds in shape to the flanged portion 22 of the body 12. The flanged portion 22 is secured along the inner edge 56 of the sealing film 52 by heating, ultrasonic welding, or similar processes. The container 51 is filled with food items. The sealing film 52 is wrapped over the food items and secured to the container 51 by heating sealing or any similar process known by those having ordinary skill in the art. The packaging 50 is stored until ready for use, during which time, the membrane element 30 remains seated against the closed end 16 of the body 12 to prevent any gas exchange through the apertures 20. Optionally, the packaging 50 may include a pressure gauge or indicator to provide information relating to the pressure levels inside of the packaging 50 to the user.

The invention has been described in an illustrative manner. It is, therefore, to be understood that the terminology used is intended to be in the nature of words of description rather than of limitation. Many modifications and variations of the invention are possible in light of the above teachings. Thus, within the scope of the appended claims, the invention may be practiced other than as specifically described.